

**Notice of Allowability**

Application No.

10/699,067

Applicant(s)

CHAKRABARTI ET AL.

Examiner

MARY STEELMAN

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**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 08/31/2007, 09/11/2007.
2. ☒ The allowed claim(s) is/are 1-3,6-11,14,15,17 (to be renumbered in order).
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |   |
|--|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application                     |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date ____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date ____     | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance  |
|  | 9. <input type="checkbox"/> Other ____.   |

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### **DETAILED ACTION**

1. This Office Action is in response to RCE, Claim Amendments and Remarks received 08/31/2007. Claims 1, 2, 3, 6-11, 14, 15, and 17 are pending.

### **EXAMINER'S AMENDMENT**

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with James K. Okamoto, Reg. No. 40,110 on 09/11/2007.

The application has been amended as follows, replace prior claims with the following:

**IN THE CLAIMS:**

1. A method of cross-file inlining during compilation of a program, wherein which files to open and close is determined based on affinity weightings between the files, wherein the affinity weightings depend on call sites and a related number of potential inlines between the files, the method comprising:

performing an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline dependencies between the call sites, and (iv) updating the inline affinity graph by reducing the affinity weightings based on the number of inlines performed; and continuing the iterative process until the affinity weightings of all edges in the inline affinity graph go to zero.

2. A method of compiling a computer program from a plurality of files of source code, the method comprising:

an inline analysis to determine which call sites in the plurality of files to inline;

an inline transformation to perform said inlining, the inline transformation including performance of an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline

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dependencies between the call sites, and (iv) updating the inline affinity graph by reducing the affinity weightings based on the number of inlines performed.

3. The method of claim 2, wherein nodes in the inline affinity graph correspond to files and edges in the inline affinity graph correspond to a number of potential inlines across corresponding files.

4. cancelled

5. cancelled

6. The method of claim 3, wherein an inline dependence for a call site is maintained including information as to a set of call sites that the call site depends upon.

7. The method of claim 6, wherein inline dependencies are representable by an inline dependence graph, wherein nodes in the inline dependence graph represent call sites, and edges in the inline, dependence graph represent dependencies between the call sites.

8. The method of claim 7, further comprising:

dynamically updating the inline dependence graph after inlinings within currently opened files are done.

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9. An apparatus for compiling a program utilizing cross-file inlining, the apparatus comprising:

a processor for executing instructions; a memory system for storing said instructions and data; and

processor-executable instructions which determine which files to open and close based on affinity weightings between potential inlines between the files, the processor-executable instructions comprising instructions to perform an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline dependencies between the call sites and (iv) updating the inline affinity graph by reducing the affinity weightings based on the number of inlines performed; and instructions to continue the iterative process until the affinity weightings of all edges in the inline affinity graph go to zero.

10. An apparatus for compiling a computer program from a plurality of files of source code, the apparatus comprising:

a processor for executing instructions;

a memory system for storing said instructions and data;

processor-executable instructions for an analyzer module, the analyzer module being configured to determine which call sites in the plurality of files to inline; and

processor-executable instructions for a transformer module, the transformer being configured to perform said inlining, the transformer module being further configured to perform

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an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline dependencies between the call sites and (iv) updating the inline affinity graph by reducing the affinity weightings based on the number of inlines performed.

11. The apparatus of claim 10, wherein nodes in the inline affinity graph correspond to files, and edges in the inline affinity graph correspond to affinity weightings between files, wherein the affinity weightings between files depend at least upon the number of potential inlines between the files.

12. cancelled

13. cancelled

14. The apparatus of claim 11, wherein an inline dependence for a call site is maintained including information as to a set of call sites that the call site depends upon.

15. The apparatus of claim 11, wherein inline dependencies are representable by an inline dependence graph, wherein nodes of the inline dependence graph represent call sites and edges of the inline dependence graph represent dependencies between the call sites.

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16. cancelled.

17. A computer program product comprising a computer-usable medium having computer-readable code embodied therein, the computer program product being compiled from a plurality of files of source code using an inlining analyzer which determines which call sites in the plurality of files to inline, and an inline transformer which performs said inlining, the inline transformer performing an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline dependencies between the call sites, and (iv) updating the inline affinity graph by reducing the affinity weighting based on the number of inlines performed, and continuing the iterative process until the affinity weightings of all edges in the inline affinity graph go to zero.

THE END

*Allowable Subject Matter*

3. Claims 1, 2, 3, 6-11, 14, 15, and 17 (to be renumbered in order) are allowed.
4. The following is an examiner's statement of reasons for allowance:

As noted on page 8, 3<sup>rd</sup> paragraph of Remarks, Carini, Chang, and other cited prior arts, taken alone or in combination, fail to disclose limitations recited in independent claims 1, 2, 9, 10, and 17:

“performing an iterative process including (i) choosing an edge in an inline affinity graph with a highest affinity weighting, (ii) retrieving and opening source files corresponding to the chosen edge, (iii) allowing inlines to proceed between the opened source files subject to inline dependencies between the call sites, and (iv) updating the inline affinity graph by reducing the affinity weightings based on the number of inlines performed; and continuing the iterative process until the affinity weightings of all edges in the inline affinity graph go to zero.”

Moreover, evidence for modifying the prior art teachings, by one of ordinary skill level in the art was not uncovered so as to result in the invention.

Thus, all remaining dependent claims, claims 3, 6-8, 11, 14, and 15 are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Steelman, whose telephone number is (571) 272-3704. The examiner can normally be reached Monday through Thursday, from 7:00 AM to 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached at (571) 272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mary Steelman

09/13/2007

**MARY STEELMAN**  
**PRIMARY EXAMINER**

A handwritten signature in black ink, appearing to read "Mary Steelman", is written over the printed name and title.